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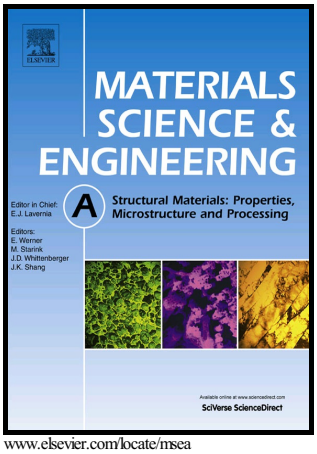

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Microstructure and property of Cu-2.7Ti-0.15Mg-0.1Ce-0.1Zr alloy treated with combined aging process

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Abstract

A combined aging process has been developed to improve the comprehensive properties of Cu-2.7Ti-0.15Mg-0.1Ce-0.1Zr alloy. This process involved pre-aging at an elevated temperature, cold rolling, and final aging at low temperature. The alloy treated by this process was found to have good electrical conductivity and super-high strength. As the alloy was solution treated at 850°C for 2 h, aged at 450°C for 8 hours, then cold rolled with the reduction of 90%, followed by aging at 400°C for 4 hours, the hardness, tensile strength, yield strength, the elongation and electrical conductivity of the alloy were up to 340Hv, 1035MPa, 982MPa, 3.1% and 20.1% respectively. TEM observation revealed that the modulated structure and ordered Cu_4Ti phases with coherent relationship with the matrix appeared during the pre-aging process. Cold rolling led to the formation of dense dislocation wall due to the dynamic interactions among the dislocations and precipitates. During the second stage of aging, the nano-scale precipitates formed in the pre-aging and the newly formed precipitates could effectively pin the dislocations formed in the cold rolling, the polygonization of recovery and recrystallization process could be retarded effectively. Therefore, the